Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2022-98

Anonymous Referee #3

Referee comment on "Snowfall in Northern Finland derives mostly from ice clouds" by Claudia Mignani et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-98-RC1, 2022

Overall Quality

This manuscript utilizes a merged-instrument approach to characterize precipitating ice particle habits at a remote site in inland Finlind. Primarily using 12-hourly soundings and the Multi-Angle Snowflake camera (MASC), the study determines via knowledge of ice particle history and growth regimes that approximately three-quarters of ice particles originate from cloud layers with top temperatures outside of the mixed-phase region (i.e., sub-liquid RH saturation [<99%]), suggesting that the majority of cloud layers are fully glaciated. Using an empirical formulation, they finally determine that the number of ice nucleating particles (INP) were likely sufficient to explain heterogenous ice production, suggesting an inactive ice multiplication mechanism (outside of possible collisions). Overall, the manuscript is of excellent quality in terms of science, documentation, figures, and structure. The authors clearly made a significant effort to explain their data processing in a concise manner. After addressing a few specific comments and technical corrections, I recommend this manuscript pursue publication in ACP.

Specific Comments

Fig 6. & ~Line 183: I would point out to the reader that the color-scales on each panel are different.

Line 159 & Fig. 3: What exactly is “visibility”? If it is similar to cloud base height, then these are an order of magnitude off. It would also be good to mention how cloud base height was detected within the instrumentation at the site. If it is a nm-wavelength active

remote sensor, then I would expect my interpretation of visibility to closely optically correspond with cloud base height.

Fig 3: I'm confused about the sea level pressure measurements. If the station is only 179 m ASL, these values are way too low.

Fig 2 & Line 134: Why 15 minutes prior to sounding release? Wouldn't 15 minutes aftertward be more representative of the cloud that is producing the precipitation?

Line 213: Nice conclusion!

Technical Corrections

Line 61: "automatically" should be "automatic"

Line 63: "summery" should be "summer"

Fig A1: "lowlight" should be "highlight"

Line 81: suggest using "length" instead of "height"

Line 94: Should "An ice particle classified" be "An ice ***is*** particle classified"?

Line 153: Should "weighed" be "weighted"?